

## **Concurrent Web Based Multi-Task Support for Control management System**

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### **Field of the Invention**

The present invention relates generally to support multiple concurrent tasks control and monitoring within a single Web browser window for any Web based control management system such as for **Intelligent Distributed Virtual Server** (Patent claimed on 3/22/2002 by same Author, Confirmation NO. 2790) and others.

### **Background of the Invention**

The traditional Web browser based control management system can perform well for many tasks which could get quick responses and could be finished in short period of time such as check remote system's status and get remote system information etc.. However, if people like to perform a task such as transfer a 4 Gig Bytes of data file to a remote system, it will take long time to be finished. Therefore, the entire Web based control management system could be hanging there and no other tasks could be performed in the same Web browser window until the tasks such as file transfer has been finished. To solve such problem and effectively support multiple concurrent tasks on Web based control management system, an user space task list could be used combined with a non-traditional distributed lock to support Web based user activities and tasks.

### **Brief Description of the Drawings**

These and other features, aspects and advantages of the present invention will become understood with reference to the following description, appended claims and accompanying figures where:

FIG. 1: shows an example simplified block diagram of an embodiment of Web based control management system. The system includes

- a) Client hosts (1), which may run certain tasks through Web browser depicted in FIG.2.
- b) Control management station (2), which includes Web interface modules, control management modules and Web server software. It may also have native Web browser and run task from it.
- c) Controlled unit (3), which may be a computer server system, or a single operational device or component.

- d) The net1, which represents any kind of connection between control management station and controlled unit. The connection could be a connection using media such as cable (Ethernet, Fibre, SCSI, and other), bus, switch/routers/adaptor etc.
- e) The net2, which represents a network connection between control management station and the client hosts. The network connection includes the network cable such as Ethernet cable and others, switch/routers and others.

FIG. 2: shows the Web based task processing flow chart.

FIG. 3: shows an non-conventional distributed lock to protect the user space task list which used by the Web interface module or control management modules to support multiple concurrent tasks initiated from the Web based menu.

- a) User space task list (2): each slot on this list can be used to hold task information issued from Web browser menu.
- b) Distributed lock (1): contrary to the conventional lock such as semaphore based or Mutex based, this lock can be acquired by one thread and may be released by another thread. Therefore, it is non-conventional distributed lock serving threads or processes on the native system.
- c) Threads:
  - 1) Web interface thread, which basically run a task by executing the code of Web interface module,
  - 2) Control management thread, which basically run a task by executing code of control management module.

It is possible to let a single thread or single threaded process to run a task by executing code including both Web interface and control management modules with some relatively simple control system. However, this not a subject of discussion for this invention due to most of principles of this invention could apply to such simple control system except a much simple lock mechanism could be used.

### **Description of the Invention**

Fig. 1, 2, and 3 shows how does the multi-concurrent tasks could be supported in Web based control management system. The described sequence bellow is corresponding to the Web based task processing flow chart provided in **Fig.2** of this invention.

- a) A task1 was issued from Web browser menu of client host (1 of FIG.1) such as to transfer a 4 Gig Bytes of data to a remote controlled unit (3 of FIG. 1).
- b) The Web server on the control management system get the tasks from remote Web browser menu's query stream and passes task information to Web interface thread (3 of FIG. 3).
- c) For each task requested, a corresponding Web interface thread will be created such as thread1 and thread3 in FIG. 3. to handle the tasks.

- d) To prevent the race from other concurrent tasks being issued from Web browser menu such as thread3 with task2 (3 of FIG. 3), Web interface thread1 (3 of FIG. 3) first acquires lock (1 of FIG.3); get an unused slot (S1) in task list (2 of FIG.3), and marks the Slot S1 as used in task list.
- e) Web interface thread1 (3 of FIG. 3) passes task1 information to control management thread2 (3 of FIG. 3) and then it exited (Fig.2).
- f) The control management thread2 (3 of FIG. 3) starts data transfer task1 in slot S1 of task list (2 of FIG. 3).
- g) The control management thread2 (3 of FIG.3) release the lock (1 of FIG.3) and let the task1 in slot S1 of task list (2 of FIG.3) run in the background of control management operation.
- h) The lock (1 of FIG.3) is available to other Web interface threads such as thread3 with task2 (3 of FIG. 3). Therefore the thread3 (3 of FIG. 3) with task2, which has waited for the lock, (1 of FIG.3) can obtain this lock now. This allows thread3 start to work on task2 just like thread1 did for task1. Further, the task2 can be **run parallel** with background task1.
- i) Once, the background task1 of data transfer is done, the slot S1 in task list (2 of FIG.3) will be reclaimed as not-used, which then could be used by other tasks in the future. Thus the data transfer task1 will not block the Web browser based control management normal operation.
- j) In addition, the status of Web based running tasks can be monitored by examining the tasks in each slot in user space task list (2 of FIG.3).

### **What is claimed is:**

#### **- Web Based Concurrent Multiple Tasks Support From a Single Web Browser Window Method**

- 1: A method for supporting multiple concurrent tasks for a Web browser based control management system comprises the steps of:
  - (a) Providing a user space task list;
  - (b) Providing a non-conventional distributed lock.
  - (c) Web interface thread gets and stores task information.
  - (d) Control management thread executes the task.

#### **- Non-Conventional Distributed Lock**

- 2: The method of claim 1, wherein
  - Step (b) further provides step of creating a sharable binary lock, which can be used by multiple threads or processes on native control management system.
  - Step (b) further provides step of allowing a shareable lock be acquired by one thread or process and be released by another thread or process.